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Inaugural Dissertation

Analogies between Plants & Animals.

on the

Analogies between Plants & Animals

John Harrison

submitted to the examination

of the

Revd. [illegible] [illegible] Provost

admitted March 8. 1817

the

Trustees and Medical faculty

of the

University of Pennsylvania

for the degree of

Doctor of Medicine

in the

By John [illegible] of [illegible]

An
Inaugural Diſsertation
On the
Analogies between Plants and Animals,
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By John [redacted] of Kentucky

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A Sketch of Analogies between Plants and Animals &c.

"each moss
Each Shell, each crawling insect, holds a rank
important in the plan of Him who framed
This Scale of Beings, holds a rank, which lost
would break the chain, and leave a gap behind
which Nature's Self would rue."

"When we contemplate Nature with the calm scrutiny of Philosophy, we shall be struck with the order, harmony & symmetry which pervade the Universe from the brightest celestial orb, to the most minute vegetable production. In no instance do we observe order, harmony and symmetry more remarkably than in the vast chain of beings, which connects all Nature, binds each individual to its neighbour, and preserves and sustains the whole.
I shall not attempt to unfold the leaves in the great volume of Nature, which contain so many of her secret works, concealed from the sight of Man.

A Sketch

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A Sketch of Analogies between Plants and Animals.

- - - "each Moss
"Each Shell, - each crawling insect, holds a rank"
"Important in the plan of Him who framed,"
"This Scale of Beings; holds a rank, which lost"
"Would break the chain, and leave a gap behind"
"Which Nature's Self wou'd rue" —

When we contemplate Nature with the calm scrutiny of philosophy, we shall be struck with the order, harmony & symmetry, which pervade the Universe; from the brights spheres above, to the most minute vegetable production. In no instance do we observe order, harmony, and symmetry more remarkably shewn forth, than in the vast chain of beings, which connects all Nature — binds each individual to its neighbour, and governs and sustains the whole.

I shall not attempt to unfold the leaves, in the great volume of Nature, which contain so many of her secret works, concealed from the sight of Man.

My object is, to point out some of the analogies subsisting between Plants and Animals, and indicate the gradation that exists, from the most complicated organic machine, to the most simple form of vegetable existence.

The immense domain of Nature has been divided into the animal, vegetable, and mineral or Foſsil, Kingdoms.

Between the vegetable and mineral or Foſsil Kingdoms, there is a clear line of demarcation, evident to the most cursory observation

But between the animal Kingdom and the vegetable republick the criterion of discrimination is obscured by the remoteneſs of the traits of distinction, and the approximation of their analogies

"We are so accustomed, says the poetic and philosophic Darwin, to consider life and irritability to be aſsociated with palpable warmth and visible motion, that we find a renitency in ourselves to ascribe them to the comparative cold and motionleſs fibres of plants"

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But to pursue the plan of philosophic reasoning, which was enforced by precept and example so cogently in the works of the immortal Bacon, we should be led to beleive, that "vegetables are but an inferior order of animals"

Anterior to entering on the investigation of the subject, suffer me to preliminate a few objections to the characterestick distinctions, as laid down by different authors with some emphasis of argument, between animals and vegetables.

The ingenious Bichat, in his "Physiological Researches," has said, that animal life is the exclusive attribute of the animal kingdom. By animal life, this great man wished to designate that order of functions, which keeps a communication with external objects, and establishes those numerous relations which the animal sustains with surrounding things.

But this universally admiſsible fact invalidates this trait of distinction, that the polypus, and animals of the Zoophyte tribe, enjoy none of those prerogatives, which superior animals poſseſs.

Therefore we must desert this untenable citadel.

Richerand contends, that a digestive tube, an internal surface for nourishment, marks a difference

We must examine this more minutely, and reason on the data afforded us by Nature with closer vigilance—prima facie, at first blush, we would allow the justice of the distinction, and concede the point without deeper consideration.

Confessedly all animals, whose structure can be anatomized by the efforts and ingenuity of man, receive their nutriment through the medium of an apparatus appropriated to the fulfilment of digestion and assimilation.

Reasoning synthetically, or a priori, we would say, that this attribute marked a visible difference; but should we analise the question more closely, we would acknowledge that an identity of digestive structure obtained in some plants, and a few animals do not enjoy this cavity

Consider the myriads of animalcules that float with silent celerity in all fluids!

Spallanzani ascertained, that animalcula infusoria, after desiccation, were resuscitated into the replete enjoyment of life, by the application of

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Consider the myriads of animalcules that float with great celerity in all fluids!

Spallanzani ascertained, that animalcules infusoria, after desiccation, were restored unto the complete enjoyment of life, by the application of distilled water; like hybernating animals roused by the genial influence of a vernal Sun.

Can we suppose, on rational grounds, that those almost inconceivably minute beings poſseſs the cavity which this acute physiologist considers as constituting the eſsence of animality?

I think it extremely problematical.

But Richerand contends that we should reject the Zoophytes which form Sponge, from the exalted region of animal nature, because they do not hold out this beacon of distinction, which he desires to put upon Nature.

Men untrammeled by the shackles of false theory, reject this species of ratiocination, as alike diſsonant to the laws of nature, and unfavourable to the advancement of Science.

The Stomach of the polypus is but a cul-de-sac; an organ susceptible of a reciprocity of actions — which now performs the functions of a digestive apparatus, and now the purposes of cuticular action.

Doubtleſs the general lymphatics of this creature's system perform the office of digestion and aſsimilation: inversion does not impair the vital efforts of the animal, nor in the least diminish the excitability of its system.

*"Ludwig defines vegetables to be "natural bodies, always endowed with the same form, but deprived of the power of locomotion." "Every branch of this definition is, with equal propriety, applicable to precious Stones, Salts, and some animals." Smellie p. 10

Their whole Surface is a Stomach: the Surface of plants is analogous to this creature's cavity for imbibition.

"Quemadmodum terra arboribus, ita animalibus ventriculus"

This quotation clearly implies, that the roots of a plant fulfil the same purposes, of digestion and assimilation, that the chylopoetic viscera of an animal perform.

We therefore think this feature of distinction a mere ignis fatuus of an excursive imagination a loose conjecture floating in the mind, not based upon observation.

Ludwig, and many others, have argued, that the power of Locomotion is peculiarly characteristic of animals.*

They were not aware of the fact, that many animals, as oysters, the Mollusca, or naked Sea worms, Corallines or Corals, are as immutably fixed to their rocky habitation, as vegetables to the Soil in which they luxuriate.

Polypi, build up immense masses of coral rock, more durable than brass: it is conjectured that the Otaheite islands are the products of these minute and multitudinous animals.

Sensation has been laid down as the sine qua non of animal existence
"A plant, says Lungius, is a living but not a sentient body, which is fixed in a determinate place, and grows, increases in size and propagates its species"

"Life, says the learned Smellie, without some degree of sensation, is an incomprehensible idea"

The inquisitive & sagacious Buffon remarks, "if sensation implied no more than motion consequent upon a stroke or impulse, the sensitive plant enjoys this faculty".
"But, if by sensation we mean the capability of perceiving and comparing ideas, it is uncertain whether brute animals are endowed with this power."

Many plants pourtray a sensibility tantamount to the state of sensibility evinced by the gall insect, the polypus, and a numerous tribe of ephemera.

A brain, has been insisted on by some, as a decisive character of discrimination.
But the polypus & many other insects are deprived of that organ.

Dr. Smith, the learned president of the Linnean Society in London, remarks, in his well written work on Botany, "the most satisfactory remark I have for a long time met with on the subject is that of M. Mirbel, in his "Traite d' Anatomie et de Physiologie végétales. He observes vol. 1. p. 19. "that plants alone have a power of deriving nourishment, though not indeed exclusively, from inorganic matter, mere earths, salts or airs, substances certainly incapable of serving as food for any animals, the latter feeding on what is or has been organized matter, either of a vegetable or animal nature. So that it should seem to be the office of vegetable life alone to transform dead matter into organized living bodies".

"This idea, observes the Dr; appears to me so just, that I have in vain sought for any exception to it."

After a perusal of this quotation emotions of astonishment will arise in our minds, should we turn to the pages of the acute Dr. G. Fordyce.

"I put gold fish, says the Dr., into distilled water, impregnated with air of the atmosphere,

in which they lived, grew, and threw out feculent matter, for six months".
"Therefore it cannot be doubted that animals may live on pure air and pure water; and that their fluids or solids may be immeadiately produced from these substances." p. 80. work on Digestion
The existence of the anamalcula infusoria, moreover, contradicts this position

Without an effort at embellishment we conceive this trait of distinction dissipated. The keen and observant Fordyce, by his experiments, has dispelled all mist, or "learn'd dust", of controversy, from this part of the feild.

Dr Smith has subjoined, that if any doubt hovers over the question, the simple experiment of burning will decide the point "But it has been observed, that vegetable productions, such as the gluten of wheat, Coutchouc, and the juice of the papaw tree, give out in burning nearly the same peculiar odour which is afforded by animal matter". Note to Smith's Botany p.24

The celebrated definition of the great and immortal Linnæus has been reverberated, like the echo of St. Peters Cathedral, until it has sunk into a faint murmur.

The imposing consequence of a name has been exemplified in every era, and in every department of life.

Such has been "the magic of a name", as the poet expresses himself, that error has passed for truth, and the rhapsodies of Sophistry for the dictates of philosophy.

Even the sage Aristotle, seated on not less than a papal throne, fulmined his literary bulls over all the vassals of philosophic credulity, and for the period of two thousand years, says Dr. Ried, he governed the opinions of the Dr Reid most enlightened part of the Species.

The history of our own profession teems with facts of similar import.

The absurd doctrines of preternatural lentor and tenuity of the blood, of concoction of the humours, of putrefaction of the fluids, and many other silly notions, were, like the responses of Delphi, received as sacred oracles from the pens of Hippocrates, Galen,

Hoffman, Sydenham, Boerhave, & several other luminaries of our Science.

On practical points the like fatuity has obtained

We therefore cannot be surprised, when we learn, that the following definition of Linnæus has been handed down, like a precious family vase, with soft touch and rapturous praise, to the present enlightened period of time.

This magazine of knowledge remarks, in his Fundamenta botanica, "Lapides crescunt, vegetabilia crescunt, et vivunt, animalia crescunt, vivunt, et sentiunt."

We cannot readily frame to our minds the idea of growth without nutrition and expansion, by the intervention of assimilating organs. Stones increase in magnitude by the simple accretion of new matter, but this is not growth: growth implies expansion by the powers of assimilation.

"Vegetables grow and live" - but here is a postulatum. Linnæus takes it for granted that vegetables live without proving the fact alleged.

"Animals grow, live, and feel".

Smellie justly remarks, that growth, life, and mere sensation, convey the most ignoble notions of animated beings. p. 11 "These are only the paſsive properties of animals."

This definition includes none of the more exalted attributes of animals; none of their instincts; none of those features of character which strongly mark a difference between animals; and the aſsemblage of a number of which, shew forth man's superiority over all created beings.

We must therefore coincide with the eloquent Buffon in considering, that neither progreſsive motion, sensation, nor mode of nourishment, points a distinction between animals and vegetables.

Other more feeble barriers of distinction have been erected by the efforts of speculative ingenuity: but the breath of opposition has dispersed them, "like the baseleſs fabrick of a vision, and left not a rack behind"

Wreck

I now proceed, to point out some of the more prominent analogies, and intimate the more clearly marked features of agreement, between animals and vegetables.

Commencing with the reproduction of the species in each, and following the boundary line of resemblance to their "ultimum Moriens" of existence.

As preparatory to the fulfilment of the functions of impregnation, an aptitude must exist in the organs appropriated to the discharge of this act.

This aptitude the higher animals conspicuously evince— union of the sexes being the result of a voluntary power.

This "paſsion of love" is denominated instinct in animals: it is as truly so in plants.

The venereal excitement is not under the dominion of reason in animals, of inferior type to man.

The disposition to venery is evolved at certain seasons of the year, varied according to the constitution of the animal, and temperature of climate.

In like manner, vegetables evince this tendency at a certain epoch of their duration.

The Abbe Spallanzani has observed, in his great work, which has shed a refulgence on physiology, that the doctrines of the ovarists, that of the vermiculists, and that founded on the two liquors, have been transfered, with necessary modifications, to plants.

The doctrines of Palengenisis, and Epigenisis, are the "leading heads, or general divisions" of the numerous theories of impregnation

The first of these doctrines supposes the preexistence of germs.

By some of the advocates for this doctrine, it was maintained that, "all the same species ab initio were neatly incased one within another, so that, agreeably to this notion, our first parent must have contained the countless millions that have populated our globe.

Darwin, whose poetry often "out-herods" his philosophy, sings with more melody than truth;

"Grain within grain successive harvests dwell,
And boundless forests slumber in a shell".

* Blumenbach p. 333.

† Blumenbach p. 335

"Some imagined the germs to be the spermatic animalcules of the male, others imagined them to exist in the ovaries of the mother."* We think this hypothesis entirely defective in affording us an explanation, at all satisfactory, of this mysterious operation of the animal and vegetable economy

Let us notice the doctrine of Epigenesis It supposes, "not an evolution of fictitious germina by conception, but a true and gradual formation of a new conception from the hitherto formless genital matter".†
Animals and plants are capable, by the same organick power, of forming, seperately and in succession, their kind. This plastick power, Blumenback denominates, Nisus Formativus.

The particular manner in which the grand object of impregnation is accomplished, is yet, to us, a "hidden light".

This Sacrum Sacrorum of Nature has not been explored.

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Many have, in the dreams of fancy, thought they had entered the "inner temple," when really they were exterior to the "outer temple," pealing anthems to hypothesis.

Not endeavoring at concealment, I think, that, the doctrine of Sympathy quadrates with the facts offered us by the vegetable creation.

We cannot admit, that a liquor, in form of a powder, called pollen, shed from the excited anther on the Stigma, with any product of the pistil, produces the Seed.

Neither is it poſsible, for the liquor of the pollen, to be conveyed to the pericarp, or Seed veſsel, by a duct, and thus by direct contact, and immeadiate agency, stimulate into life the Seed

Spallanzani and Bonnet in vain searched, with sight acuminated by philosophy, for this tube.

Mr Adanson has laid it down as a certain truth, that the smallest imaginable particle of pollen, falling upon the Stigma,

will produce impregnation.
Spallanzani found, that a diluted solution of the semen of the male frog, applied in the smallest quantity to the ova, as they iſsued from the female, was efficient in fecundating.

We might apply inquisitonial tortures to bend the rigidity of the theory, of the direct application of the semen, but we could not explain all the phenomena attending vegetable impregnation.

Different parts of the vegetable economy syncronise in action, and sympathise in feeling.

For example, when we cut the minutest portion off the leaf of the mimosa, the whole plant trembles, and falls into a state of collapse.

We think that impregnation is accomplished by the influence of action, communicated by means of sympathy, from the stigma along the pistil to the pericarp.

* Rees Cyclopadia, Art. Generation.

† Errata. Here I must deprecate the severity of just criticism for the employment of several words, that have been "stampt'd in the mint" of American genius.

I can only plead the authority of men, if not of claſsical, yet of diffusive, learning

The usual division of animals into oviparous and viviparous, though comprehensive, is not perfect.

Some animals are neither oviparous nor viviparous, but truly gemmiparous, generating by shoots.

The armed polypus, the hydra of Linnaeus, the sea anemone, (Actinia) generate like plants, by sending off shoots.

The hermaphrodite and monoicous plants closely resemble the acephalous Molusca, in the accomplishment of the generative process.*

"Many striking analogies, says Smellie, subsist between the eggs of animals and the seeds of plants."

The fœtus in utero, in the early months of pregnancy, has been analogized to the seed in the earth.

After the ovum is deposited in the uterus, the flocculent vessels of the chorion drink in nutrition from the secreted fluid afforded by the internal membrane of the uterus.

† Smellie.

The placenta, formed of those veſsels, resembles in its functions the cotyledons of a seed after its emergence from under the Surface of the earth.

"The seed as the egg is covered with a shell or crustaceous membrane."

"Another membrane invests the pulpy lobes of the seed. Each lobe, like the yolk of the egg, is involved in a seperate membrane."

"Eggs and seeds are organs obviously formed on the same plan and destined by nature to fulfil the same general intention." †

Richerand observes, "the existence of the fœtus in utero is solely vegetative."

Dr Osborn, p 36, denies the fœtus the enjoyment of sensation.

Perhaps, his objections to the fœtus poſseſsing this faculty, are as valid as the objections raised to vegetable sensation.

Hybrid productions result from vegetable union, between different varieties and species, as between animal

* Smellie

Jameson found that, "the pistilla of the nicotiana rustica, which has egg shaped leaves and yellowish corals, with the pollen of the nicotiana paniculata, with round leaves and greenish petals, produced a hibrid plant resembling both species in every part." p. 38. ✓

A vegetable fœtus has been discovered in plants

"In the end of Autumn, if the coats of any bulbous root are diſsected, the entire plant in miniature will appear in the centre of the root"*

"M. Mariotte and many other writers, have seen in the bulb of the tulip, not only leaves, but even flowers, and the Stamina"

Every animal and vegetable is destined, by the laws that regulate the harmonic actions of their System, to work out their existence in a limited space of duration. Some plants spring up, exhale their lives on the paſsing wind, and are seen no more.

Many microscopic animals expire a few hours after their existence.

Certain plants spring up and unfold themselves in the vernal season. Many insects evolve their existence in this season.

They terminate their vital course, and others come on the stage.

We see infinite wisdom displayed in ordaining that a diversity should exist in the organic creation.

Were all plants to shoot forwards at once to the melody of vernal Nature, they would inevitably choke each other. If the immense profusion of creatures, that are succeſsively introduced on the arena of life, were to push forwards at once, the besom of destruction would sweep them off in one general maſs.

Having touched upon the general analogies existing between Plants and animals, in the structure and economy of the organs appropriated to generation, we will pencil a few lines of resemblance subsisting between

their organization and functions.
The oſseous system is the basis upon which the fabrick of the more perfect animals is built.

In all animals, we observe some structure calculated to answer the purposes of bones.

In plants the ligneous portion fulfils the offices of bones.

Both animals and plants poſseſs a parenchymatous portion

The ligneous and parenchymatous portions are regularly disposed, in such a manner, as to allow the intervening expansion of veſsels; which veſsels, are destined to perform the different functions neceſsary to the nourishment, growth, and maturity of the plant.

Between the organization of animals, (which are gifted with many organs, destined to exercise high powers of action, and fill a large range in the feild of exertion,) and insects, we remark a wide chasm, "far as between the mole's dim curtain and the Lynx's beam".

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But numerous insects are entirely destitute of particular organs.

Many have no heart, nor brain, nor seperate pulmonary organs.

In those semi-animated beings, which are the connecting link in the great chain of nature, we observe an organization extremely simple, and reduced to the exercise of a few functions.

Like vegetables, they are stationary; have vessels; and fluids circulating in those vessels; absorbents to take up a nutrient fluid; powers of reproduction, and are limited to exist on the bounty of nature an allotted period of time.

The lymphatics, in the roots of plants, perform the office of lacteals:

They digest and assimilate the fluids presented.

It is well known, to every person conversant with vegetable physiology that, the vis insita of the vessels propels the fluids through them.

It is not mere capillary attraction, but a living process, instituted by a living body.

* By this expression I mean, that the substances secreted do not reside, in propria forma, in the blood.
The materials may exist, but the gland is the architect, or manufacturer.

The vegetable secretion is accomplished in a manner analogous to animal secretion.

The substances secreted, were not in the circulating Maſs,* anterior to the action of the secretory veſsels: the incomprehensible operation of the veſsels created < the substances secreted, to their respective glands.

Vegetables have irritability, sensibility, and Dr Darwin thinks, voluntary Motion. The veſsels, in the propulsion of their respective fluids, in the absorption of nutriment, & in the secretion of peculiar fluids, as resinous substances, honey, and balsamic articles, pourtray inefragable proofs of irritability.

Van Uslar found, that electric impulses destroyed the irritable action of the veſsel: after a smart shock the veſsels would not bleed, or discharge their fluids, after being cut.

The Dionæa Muscipula, Venus' fly-trap, presents us with a strong example of vegetable irritability.

"The leaves of this plant are armed with spines on their upper edge, and are spread on the ground around the Stem." "When an insect creeps on any of them in its paſsage to the flower or seed, the leaf shuts up like a steel rat-trap, and destroys its enemy". Zoonomia p. 101.

Dr. W. P. C. Barton, to whom I owe many of my ideas on this topick, observes "one more plant I will instance as an evidence of the spontaneous motion, or irritable action, of vegetables.

"It is the well known Berberis Vulgaris or Barberry: a shrub remarkable for another property it poſseſses, of blighting grain in its vicinity."

"The irritability of the Stamens of the Barberry is well ascertained, and it is one of the best examples, that can be given of this property".

The question of the sensibility of plants has been agitated, with all the warmth of feeling and ingenuity of argument, that the heart could dictate, or the head devise.

*"It's a plant of the claſs diaecia, order decandria of the Linnean arrangement, or as Darwin says, of the claſs of two "brotherhoods, ten males".

Profeſsor W. P. C. Barton.

The Mimosa Sensitiva, or Sensitive plant, is as "tremblingly alive all o'er", as the most delicate lady who is lulled on the couch of luxury.

"Weak with nice sense the chaste Mimosa stands,
From each rude touch withdraws her timid hands"

The sensibility of plants is evinced by the approach of the anthers, in some flowers, to the Stigmas.

The Sleep of Plants is a strong corroborating circumstance in favour of the opinion of their enjoying sensibility and irritability. Although this idea may appear "deck'd with hyperbole", but it is perfectly philosophical. A repose is as neceſsary, for the replenishment of the vital principle in Plants, as in Animals.

A beautiful illustration of vegetable Spontaneous Motion is given us by the Hedysarum gyrans.

This plant has been called also "Dionæa giatria, by botanists."*

"Its leaves are continually in spontaneous and quick motion, some rising and others

The Mimosa Sensitiva, or Sensitive Plant, is so "trembling alive all o'er" as the most delicate lady who is taken in the carriage of luxury.

"Weak with nice sense the chaste Mimosa stands From each rude touch withdraws her timid hands."

The sensibility of plants is evinced by the approach of the [illegible] [illegible] [illegible] to the [illegible]

The Sleep of Plants is a thing corroborating [illegible] in favour of the opinion of those assigning sensibility and irritability although this idea may appear to be the hyperbole" but it is perfectly philosophical [illegible]

[illegible]

†. The Spontaneous movement, or what Dr. Darwin denominates, the voluntary action, of plants, vines evince: a cucumber vine, (Cucumis Sativus) by a Species of instinct directs its branches to a vessel of water: the hop vine (Humulus Lupulus) by intuitive action rears its slender length up a pole.

falling: others whirling circularly by twisting their stems".
"This takes place when there is no air, and seems to be as neceſsary to the plant as perpetual respiration to animal life".

"The leaves, says Smellie p. 14, of the Tamarind tree (Tamarindus indica) contract round the tender fruit, and protect it from nocturnal cold."
"The Caſsia or Senna, the glycine, and many of the papilionaceous plants, contract their leaves in a similar manner." T.

The leaves of plants perform the same functions in the vegetable, that the lungs do in the animal economy.
By varnishing a leaf you injure the health of the plant.
In a qualified sense, "oxygen fills the fine lungs of all that breathe or bud;" neither animals nor vegetables could exist without the influence of oxygen.

Dr. Henry, (p. 206. E.x1. Dr. Coxe's edition,) after noticing the salutary operation of carbonic acid gas, applied to the roots of plants, in pushing forward growth, says, "on the contrary, carbonic acid gas, applied as an atmosphere, by confining a living vegetable in the undiluted gas over water, is injurious to the health of the plant, especially in the shade".

Deprive a plant of its foliage, it dies. "It is labouring under an astma or dying of a suffocation".

"Some plants, as well as animals, are amphibious, as the Rush (Juncus) and the frog: others are parasites"
The Misletoe (Viscum) feeds on the oak; and every animal is fed upon by smaller kinds.
Some parts of our system partake of vegetation; as the hair and nails.

A relationship exists between the production of certain plants and animals.

St. Pierre has descanted with dignity and expansiveneſs, on the harmonies of Plants and Animals.

"Nature, a mother kind alike to all," acts the part of a benevolent caterer.

No insect, however mean in the eye of vain man, is unprovided for; or introduced on the Stage of existence to be poisoned by the cup of hunger.

The vegetable, as the animal constitution, is susceptive of an hereditary impreſs.

The plant from the seed of a tropical vegetable, will struggle to maintain the habits of it's parent.

Such plants put forth their leaves and bloſsoms a fortnight earlier, than indigenous ones.

Vegetables evolve heat. This is proved by their keeping up an equanimity of temperature, but in a much leſs degree than animals, in different degrees of atmospheric temperature.

Dr. Smith remarks, "heat can scarcely be denominated a secretion, and yet is undoub

* Smiths Botany. p. 83. T

†"Fruits and leaves, situated in the Sun, preserve themselves cool, while surrounding objects are heated.

"Sonnerat discovered in the island of Lucon a rivulet, the water of which was so hot, that a thermometer immersed in it rose to 175° Fahr." Plants grew on its banks.

In the high latitudes plants grow.

Thirty species of plants grow in the island of Stitzbergen. note to Smith's Botany. 83-4 tedly a production, of the vegetable as well as the animal body, though in a much lower degree in the former than the latter."

"Mr Hunter appears to have detected this heat by a thermometer applied in frosty weather to the internal parts of vegetables newly opened."*

Thus have I endeavoured to point out some of the more overt analogies between Plants & Animals.

The nature of our Diſsertations, will not allow the prolongation of enquiry, or the expansion of our "little gold" to a wider surface.

Nature, has fixed a graduated scale on organic creation, from the humble Moſs we trample under foot, to Man "great Lord of all".

Let us, with humble reverence suppose that vegetables participate in some low degree of the common allotment of vitality; and that one great Creator tion a knowledge, of the vegetable as well as the animal body, though in a much lower degree in the former than the latter.

Mr Hunter appears to have detected the heat by a thermometer applied in vessels [illegible] to the internal parts of vegetables newly formed.*

Thus have I endeavoured to point out some of the more direct analogies between Plants & Animals.

The nature of my subject [illegible] will not allow the prolongation of enquiry on the extension of an "[illegible]" [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] great [illegible] and also."

It is [illegible] that vegetables [illegible] low degree of [illegible] [illegible] and that [illegible]

hath appointed good to all living things,
"in number, weight, and measure".
Therefore, let us acquiesce with Pope
in saying:

"Far as Creations ample range extends,"
"The Scale of Mental, Sensual powers ascends:"
"Mark how it mounts to Mans imperial race,"
"From the green Myriads in the peopled grass:"
— — — — — —

"Vast chain! which from God began;"
"Natures etherial, human, angel, Man;"
"Beast, bird, fish, insect, what no eye can see,"
"No glass can reach; from infinite to thee"
"From thee to Nothing." — —

And conclude by saying, with placid
emotions of pious rapture;
"All are but parts of one stupendous whole"
"Whose body nature is, and God the Soul."

Finis.